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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

BEREZNY, NEAL

ART UNIT PAPER NUMBER

2823

DATE MAILED: 01/30/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/276,803

Applicant,

LEE ET AL.

Examiner

Neal Berezny

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2001 and 10 August 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 7-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 1999 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Acknowledgements

1. Examiner's objection to claim 6 under 37 CFR 1.75(c), has been overcome by applicant's cancellation of claim 6 and the objection is withdrawn.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly ~~claiming the subject matter which the applicant regards as his invention.~~

3. Claim 9 recites the limitation "the first temperature" in line 9. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-5, 7-8, 11, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Shareef et al. (6,162,744) in view of Ping et al. (5,882,979). Al-Shareef teaches forming a storage electrode, a high dielectric layer, a plate electrode, a first anneal at a first temp. at 600-800°C, see claim 28, a second anneal at a second temp. less than the first temp. and at 100-600°C, see claim 2, the high

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dielectric consisting of STO, BST, and PZT dielectrics, col.4, ln.5-6, the electrodes consisting of RuO₂ conductors, col.3, ln.55-60, forming an interdielectric over the capacitor, col.5, ln.29-30, and where the first and second anneals are performed after the formation of the high dielectric, col.4, ln.63-64. Al-Shareef appears not to specifically state that the two anneals be conducted in-situ. Ping teaches performing various processes in-situ, col.3, ln.4-5, fig.1 and 2, including an anneal step. It would be obvious to one of ordinary skill in the art at the time of the invention to combine Ping with Al-Shareef to perform the two anneal process steps in-situ in order to reduce the

risk of contamination from the external environment. Further, official notice is given that it is well known and commonly practiced to employ clustering tools and in-situ processing to reduce processing time and exposure to the external environment, especially when the processing steps are very similar, requiring minimal variations between steps.

6. Al-Shareef, claim 9, also teaches at least one of the two anneals to be conducted in a plasma environment, and under various environments, col.4, ln.17-39, but appears to be silent in specifying the specific equipment to be used to achieve these conditions. Official notice is given that given the teachings of Al-Shareef, it would be obvious to achieve the taught anneal conditions in well-known equipment commonly used for such applications, such as a furnace or in a vacuum RTP, and as suggested and anticipated by Al-Shareef they can be performed either separately or in-situ. One of ordinary skill in the art would be motivated to use commonly available equipment to achieve the taught anneals in order to keep process costs low.

7. Al-Shareef also teaches at least two multiple temperatures in multiple annealing steps, suggesting and anticipating more than two anneals. Al-Shareef appears not to specifically require that the third temp. be less than the second temp. It would be obvious to one of ordinary skill in the art to perform a third anneal at a lower temperature in order to reduce oxygen vacancy and densify the film, col.4, ln.55-57. Further, it has been held that a mere duplication of a process step, or the division of a single step into multiple steps, involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8. In addition, neither the claims nor the specifications disclose the critical nature nor unexpected results arising from a third anneal.

8. Claims 9-10, 12-13, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Al-Shareef et al. (6,162,744) in view of Azuma et al. (WO 96/02067 PCT) and Wolf, Vol.1, p.57. Al-Shareef teaches forming a storage electrode, a high dielectric layer, a plate electrode, a first anneal at a first temp. at 600-800°C, see claim 28, a second anneal at a second temp. less than the first temp. and at 100-600°C, see claim 2, the high dielectric consisting of STO, BST, and PZT dielectrics, col.4, ln.5-6, the electrodes consisting of RuO₂ conductors, col.3, ln.55-60, forming an interdielectric over the capacitor, col.5, ln.29-30, and where the first and second anneals are performed after the formation of the high dielectric, col.4, ln.63-64.

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10. Al-Shareef also teaches at least two multiple temperatures in multiple annealing steps, suggesting and anticipating more than two anneals. Al-Shareef appears not to specifically require that the third temp. be less than the second temp. It would be obvious to one of ordinary skill in the art to perform a third anneal at a lower temperature in order to reduce oxygen vacancy and densify the film, col.4, ln.55-57. Further, it has been held that a mere duplication of a process step, or the division of a single step into multiple steps, involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8. In addition, neither the claims nor the specifications disclose the critical nature nor unexpected results arising from a third anneal.

11. Al-Shareef, while teaching the preferred embodiment, also anticipates performing one or both anneals after the formation of the second electrode, col.5, ln.6-10, but fails to elaborate on the specific combinations of anneals that should not be performed post plate electrode formation. Azuma teaches performing the second anneal after the

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formation of the plate electrode, fig.4, el.P47, P48, and P50. Wolf teaches performing various interconnect thermal processes, which in terms of structure and function are also anneals, after the formation of the interdielectric, p.57, table 4, section 3. It would be obvious to one of ordinary skill in the art to combine the teachings of Azuma and Wolf to the anticipated processes of Al-Shareef, i.e. to perform thermal anneals after forming the plate electrode, to further include anneals, i.e. thermal interconnect processes, which would need to, or likely, be performed after either the formation of the plate electrode or after the formation of the interdielectric. It would be obvious to one of

ordinary skill in the art to anticipate the process of performing one or both of the anneals, i.e. thermal interconnect processes, after either the formation of the plate electrode or the interdielectric, to complete the device and provide flat, low resistance interconnects. One would be motivated to combine Azuma and Wolf with Al-Shareef in order to reduce the post capacitor thermal budget and reduce the risk of oxidation of either of the electrodes from any out-diffusion of oxygen from the high dielectric layer, thereby reducing the capacitance of the capacitor. Official notice is given that it is well known in the art that various essential thermal interconnect processes, or anneals, are commonly performed throughout the industry, after the formation of the capacitor plate and the interdielectric layer. Further, such thermal processes, even when desired to be eliminated, cannot in practice be eliminated, because the consequences, for example non-planarized topography or non-silicided interconnects would result in poorly functioning devices and severe processing problems in subsequent steps. In

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conclusion, it is almost an inherent property of devices to undergo several anneals after the formation of the capacitor.

12. In addition, neither the claims nor the specifications disclose the critical nature nor unexpected results arising from performing one or both anneals after the formation of either the plate electrode or the interdielectric. Applicant need not disclose such details if applicant concedes that such details are obvious and well known in the art, but that would also estop applicant from asserting patentability, based solely on those details.

Response to Arguments

13. Applicant's arguments filed 11/13/01 have been fully considered but they are not persuasive. Applicant has traversed Examiner's holding that applicant's hand-written marked-up version of the amendment was not responsive. Applicant asserts that 37CFR1.121 does not require the marked-up version be typed. In response to applicant's inquiry into the matter, examiner had left a voice message for applicant's representative, Andrew Telesz, on 10/26/01 citing the following regulations. Under 37CFR1.58, MPEP 608.01, and 37CFR1.52(a)(1)(iv), "**all papers to become part of the permanent record must be legibly written either by a typewriter or mechanical printer**". Further, such submissions are required to be on sheets of paper with specific margins. Applicant's hand written submission cannot be entered into the record for at least the above reasons, i.e. not typed, no margins, and not legible, and therefore,

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applicant has failed to provide a marked-up version that can be entered into the record as required by 37CFR1.121. Further, applicant's assertion that the hand written submission "does not render the Amendment unintelligible or burdensome to consider", is strenuously challenged in every respect. The hand writing is not intelligible, written material was placed in the margins with arrows directed in multiple locations, holes were punched in the margins for securing the papers in the jacket, such holes punched out part of applicant's writings in the margin, which also requires that the entire jacket be dissected in order to view material above and beside the punched holes. The hand written submission was both unintelligible and a huge burden, and was not considered. Examiner's holding of non-responsive is sustained and made final.

14. Applicant is warned that since applicant's representative has been fully informed of the basics of paper submissions to the Office, any further similar hand written submissions will be treated as deliberately non-responsive.

15. Applicant's arguments filed 8/10/01 have been fully considered but they are not persuasive. Applicant's arguments with respect to claims 1-5, 7, 8, 10, 11, 13, and 14 have been considered but are moot in view of the new ground(s) of rejection. The scope of the claims was changed with the limitation of in-situ annealing.

16. Applicant argues that the 103 rejection of independent claims 9, 12, and 15 are improper on the grounds that there are no teachings in Al-Shareef, Azuma, or Wolf of

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both the first and second anneals occurring after the formation of the plate electrode and/or the interdielectric layer. Regarding applicant's arguments related to Al-Shareef, applicant's attention is directed to the **entire** passage cited by examiner, col.5, ln.6-10, specifically col.5, ln.7-10. Al-Shareef discusses a preferred embodiment, wherein it is specifically stated that it is not desirable to perform the anneals after the formation of the plate electrode and then proceeds to explain why. Clearly, Al-Shareef anticipated performing the anneals after the formation of the plate electrode, but concluded that such a strategy was undesirable for the reasons disclosed by the reference, and

therefore, elected to perform the anneals before the formation of the plate electrode.

The reference need not agree with applicant to have anticipated the claimed invention.

17. Applicant expressed uncertainty as to how Wolf teaches the performing anneals after the plate electrode. Wolf teaches the effects of thermal processing and the use of thermal budgets, which is well known in the art. The table and section cited are a listing of thermal processes performed when forming interconnects. Since interconnects are formed after the formation of capacitors and all thermal processes anneal the structure, then one of ordinary skill in the art would realize that a number of anneals are commonly performed after the formation of the capacitor.

18. Applicant argues, page 9, that Al-Shareef teaches away from the claimed invention, which is not a relevant issue. The question is whether Al-Shareef teaches away from the combination with Azuma and Wolf. Applicant fails to make such a case.

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19. Examiner had challenged the critical nature of the post capacitor anneals in the claims and/or the specifications. Applicant responded by identifying in the specifications, page 11, ln.4-7, statements that the post anneals produce "a high capacitance and a low leakage current". These statements merely draw a conclusion without even suggesting how such a conclusion could be reached. In applicant's arguments a statement is added "whereby oxidation of the barrier layer is suppressed". Such an assertion has not been found in the claims or the specifications, nor is it clear how the oxidation of the barrier layer, which is under the capacitor, has an effect on the capacitor's leakage current or capacitance, nor how the post anneals would even achieve such a result.

CONCLUSION

20. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

21. A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of


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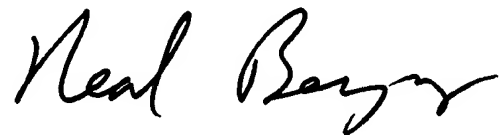
the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Neal Berezny whose telephone number is (703) 305-1481. The examiner can normally be reached on Monday to Friday from 9:00 to 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy, can be reached at (703) 308-4918. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7724.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


George Fourson
Primary Examiner
2823


1-27-02

Neal Berezny

Patent Examiner

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